

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : ROHM CO LTD

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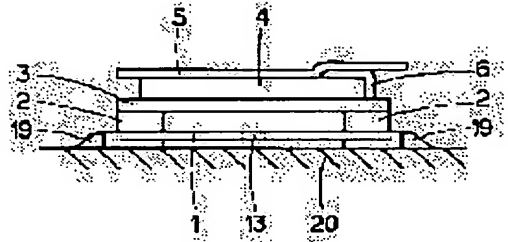
(72)Inventor : YOSHIMURA TAMOTSU

## (54) PIEZOELECTRIC BUZZER

### (57)Abstract:

**PURPOSE:** To enable reflow soldering and automatic packaging by mounting a diaphragm and a piezoelectric element onto a conductive elastic body on a flexible substrate and coating the surface of the piezoelectric element with a protective cover.

**CONSTITUTION:** This piezoelectric buzzer is constituted of the heat resistant flexible substrate 1 having a pair of terminals the annular conductive body, for example, conductive rubber 2, mounted in contact with the one terminal on this substrate 1, the diaphragm 3 and piezoelectric element 4 provided successively on this conductive rubber 2 and the heat resistant protective cover 5 stuck removably on the front surface of the piezoelectric element 4. The flexible substrate 1 is packaged by reflow soldering to a substrate 20 on an electronic apparatus side. The conductive parts of the flexible substrate 1 and the wiring patterns on the substrate 20 are connected by solder fillet 10. The other terminal of the substrate 1 and the piezoelectric element 4 are connected by a projecting piece 6. A part of the flexible substrate 1 is first bent to the rear surface side and thereafter the reflow soldering is executed at the time of packaging to the substrate 20 on the apparatus side in such a case.



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30.03.1999

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3162467

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23.02.2001

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decision of rejection]

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**CLAIMS**

[Claim(s)]

[Claim 1] The piezo-electric buzzer characterized by having prepared the electric conduction elastic body contacted for one terminal on the flexible substrate which prepared the terminal of a pair, having attached the diaphragm and the piezoelectric device in order on this electric conduction elastic body, having connected the other-end child and the piezoelectric device, and covering the front face of a piezoelectric device with a dismountable protective cover further.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the piezo-electric buzzer built in a calculator or an electronic notebook.

[0002]

[Description of the Prior Art] The piezo-electric buzzer is used for small electronic equipment, such as a calculator and an electronic notebook, so that you may surely say as a sound source which emits a beep sound, a confirm call, etc. There are that into which it was put by the case, and a thing without that right in this piezo-electric buzzer. The piezo-electric buzzer without a case pasted up the piezoelectric device 31 on the diaphragm 30, as shown in drawing 6, it connected lead wire 32 and 33 to each, and as shown in drawing 7 as it is, it has included this in electronic equipment. In this case, after fixing a diaphragm 30 to the predetermined location of a substrate 40 prepared in the case 42 of electronic equipment in double-sided tape 41 grade and attaching a piezoelectric device 31 on a diaphragm 30, a diaphragm 30 and a piezoelectric device 31 are soldered to the circuit pattern on a substrate 40 (not shown) through lead wire 32 and 33. In addition, output port 42a for leading an audible tone to the case exterior is formed in the case 42.

[0003] On the other hand, the piezo-electric buzzer of a case mold arranges a diaphragm 50 and a piezoelectric device 51 in the case 60 where it has the lead pin 61 of output port 60a of a sound, and a pair, as shown in drawing 8. In this case, case 60 the very thing functions as a resonance object.

[0004]

[Problem(s) to be Solved by the Invention] By the way, since it is inferior to thermal resistance in a piezoelectric device 31 to mount a piezo-electric buzzer in electronic equipment like drawing 7 with nakedness, a calculator, an electronic notebook, etc. are for being small, and a tooth space having constraint (especially constraint of the thickness direction), and using the case 42 of a device as the case of a piezo-electric buzzer. For this reason, it surely depends for the activity which solders a piezoelectric device 31 to the substrate 40 by the side of a device on a help in many cases.

[0005] Therefore, the purpose of this invention is to offer the piezo-electric buzzer which does the soldering activity by the help unnecessary from the mounting process to the electronic equipment of a piezo-electric buzzer, and enables reflow soldering and automatic mounting.

[0006]

[Means for Solving the Problem] In order to attain said purpose, the piezo-electric buzzer of this invention prepares the electric conduction elastic body contacted for one terminal on the flexible substrate which prepared the terminal of a pair, attaches a diaphragm and a piezoelectric device in order on this electric conduction elastic body, connects an other-end child and a piezoelectric device, and is characterized by covering the front face of a piezoelectric device with a dismountable protective cover further. With this configuration, since the diaphragm and the piezoelectric device are attached in the flexible substrate through the electric conduction elastic body, reflow soldering can be carried out and surface mounting becomes automatic and possible at the substrate by the side of electronic equipment. And since the piezoelectric-device front face is

covered with the protective cover, it can prevent that flux adheres to a piezoelectric device even if it performs reflow soldering, or solder waste disperses.

[0007] In addition, the flexible substrate and electric conduction elastic body and protective cover which constitute the piezo-electric buzzer of this invention are taking into consideration the heat at the time of reflow soldering, and it is desirable that a gap is also thermal resistance. By vapor-depositing aluminum to a protective cover especially, thermal reflection increases and a weak piezoelectric device can be effectively protected with heat.

[0008]

[Example] Hereafter, the piezo-electric buzzer of this invention is explained based on an example. The side elevation in the condition of having attached the piezo-electric buzzer concerning the one example in the substrate in electronic equipment, such as a calculator and an electronic notebook, (for example, polyimide flexible substrate) is shown in drawing 1. This piezo-electric buzzer consists of the heat-resistant flexible substrate 1 which has the terminal of a pair, an annular electric conduction elastic body (for example, heat-resistant electrical conductive gum which consists of silicon and carbon) 2 which was contacted for one terminal and attached on this substrate 1, the diaphragm 3 and piezoelectric device 4 which were prepared in order on electrical conductive gum 2, and a heat-resistant protective cover (for example, the film or sheet which vapor-deposited aluminum) 5 stuck on the front face of a piezoelectric device 4 dismountable. The flexible substrate 1 is mounted in the substrate 20 by the side of electronic equipment by reflow soldering, and the current carrying part (after-mentioned) of the flexible substrate 1 and the circuit pattern on a substrate 20 (not shown) are connected by the solder fillet 19. Moreover, the other-end child and piezoelectric device 4 of a substrate 1 are connected with the protruding piece 6.

[0009] The flexible substrate 1 presents the shape of about 4 square shapes, annular electrical conductive gum 2 is attached in the periphery approach of this square-like substrate 1, electrical conductive gum 2 is made to contact, the circular diaphragm 3 is fixed, and the circular piezoelectric device 4 is being further fixed on the diaphragm 3 so that drawing 2 which shows the top view in the condition of having removed the protective cover 5 in the above-mentioned piezo-electric buzzer may show. In this example, the flexible substrate 1 before being soldered to the substrate 20 by the side of a device is in a condition as shown in drawing 5. That is, the current carrying parts 1a and 1b of a pattern as shown according to a mesh line all over drawing are formed in the front face of this substrate 1, and current-carrying-part 1b follows further current-carrying-part 1c formed in the protruding piece 6 attached to the substrate 1. The suitable reinforcing materials 11 and 12 are joined to the rear face of a substrate 1 along the opposite side of a pair. Moreover, the hole 13 used as an airstream way is drilled in the center of a substrate 1.

[0010] When attaching such a substrate 1 in the substrate 20 by the side of a device, the lateral part of Lines a and b is bent to the rear-face side of a substrate 1 from the part shown with alternate long and short dash lines a and b all over drawing. The rear-face Fig. of the substrate 1 in the condition of having bent is shown in drawing 3. The current carrying parts 1a and 1b which the lateral part of each alternate long and short dash line a and b of current carrying parts 1a and 1b will appear in the rear face of a substrate 1, and have it in this rear-face side serve as a terminal, and are soldered to the circuit pattern prepared in the substrate 20 by the side of a device so that drawing 3 may show.

[0011] Although not shown in drawing 5, annular electrical conductive gum 2 contacts current-carrying-part 1a, and does not contact current-carrying-part 1b. Moreover, as shown in drawing 4, a protruding piece 6 is connected on a piezoelectric device 4, and, thereby, current-carrying-part 1c of a protruding piece 6 is connected to a piezoelectric device 4. Therefore, the circuit from the circuit from the circuit pattern by the side of a device to a diaphragm 3 through current-carrying-part 1a and electrical conductive gum 2 and the circuit pattern by the side of a device to a piezoelectric device 4 through current-carrying-part 1b and current-carrying-part 1c is formed, and an electrical potential difference is impressed to a diaphragm 3 and a piezoelectric device 4 through both circuits.

[0012] Thus, at the constituted piezo-electric buzzer, some flexible substrates 1 are first bent from alternate long and short dash lines a and b to a rear-face side as mentioned above on the

occasion of mounting to the substrate 20 by the side of a device. Then, although reflow soldering is performed, since the flexible substrate 1, electrical conductive gum 2, and a protective cover 5 are thermal resistance, the effect of heat does not receive them at the time of reflow soldering. Moreover, since the piezoelectric device 4 is covered with the protective cover 5, flux does not adhere to a piezoelectric device 4, or solder waste does not disperse. After the current carrying parts 1a and 1b by the side of substrate 1 rear face are connected to the circuit pattern on a substrate 20 by soldering, mounting to the device of a piezo-electric buzzer is completed by removing a protective cover 5 (refer to drawing 1 ).

[0013] And if an electrical potential difference is impressed to a diaphragm 3 and a piezoelectric device 4 through said circuit, as everyone knows, a diaphragm 3 will vibrate and an audible tone will be emitted by the piezoelectric device 4. It seems that of course, trouble is not caused to vibration of a diaphragm 3 since only the periphery of a diaphragm 3 is supported by electrical conductive gum 2 and a hole 13 exists in the flexible substrate 1.

[0014]

[Effect of the Invention] Since the piezo-electric buzzer of this invention is constituted as explained above, it has the following effectiveness.

(1) The soldering activity by the help becomes unnecessary, and since reflow soldering and automatic mounting are attained and can moreover assemble by the shape of a hoop, excel in mass-production nature.

(2) It can consider as a very thin and light surface mounting mold.

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[Translation done.]

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**TECHNICAL FIELD**

---

[Industrial Application] This invention relates to the piezo-electric buzzer built in a calculator or an electronic notebook.

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PRIOR ART

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[Description of the Prior Art] The piezo-electric buzzer is used for small electronic equipment, such as a calculator and an electronic notebook, so that you may surely say as a sound source which emits a beep sound, a confirm call, etc. There are that into which it was put by the case, and a thing without that right in this piezo-electric buzzer. The piezo-electric buzzer without a case pasted up the piezoelectric device 31 on the diaphragm 30, as shown in drawing 6, it connected lead wire 32 and 33 to each, and as shown in drawing 7 as it is, it has included this in electronic equipment. In this case, after fixing a diaphragm 30 to the predetermined location of a substrate 40 prepared in the case 42 of electronic equipment in double-sided tape 41 grade and attaching a piezoelectric device 31 on a diaphragm 30, a diaphragm 30 and a piezoelectric device 31 are soldered to the circuit pattern on a substrate 40 (not shown) through lead wire 32 and 33. In addition, output port 42a for leading an audible tone to the case exterior is formed in the case 42.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Since the piezo-electric buzzer of this invention is constituted as explained above, it has the following effectiveness.

- (1) The soldering activity by the help becomes unnecessary, and since reflow soldering and automatic mounting are attained and can moreover assemble by the shape of a hoop, excel in mass-production nature.
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**TECHNICAL PROBLEM**

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**MEANS**

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[Means for Solving the Problem] In order to attain said purpose, the piezo-electric buzzer of this invention prepares the electric conduction elastic body contacted for one terminal on the flexible substrate which prepared the terminal of a pair, attaches a diaphragm and a piezoelectric device in order on this electric conduction elastic body, connects an other-end child and a piezoelectric device, and is characterized by covering the front face of a piezoelectric device with a dismountable protective cover further. With this configuration, since the diaphragm and the piezoelectric device are attached in the flexible substrate through the electric conduction elastic body, reflow soldering can be carried out and surface mounting becomes automatic and possible at the substrate by the side of electronic equipment. And since the piezoelectric-device front face is covered with the protective cover, it can prevent that flux adheres to a piezoelectric device even if it performs reflow soldering, or solder waste disperses.

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## EXAMPLE

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is a side elevation in the condition of having mounted the piezo-electric buzzer concerning one example of this invention in electronic equipment.

[Drawing 2] In the piezo-electric buzzer shown in drawing 1 , it is a top view in the condition of having removed the protective cover.

[Drawing 3] In the piezo-electric buzzer shown in drawing 1 , it is the rear-face Fig. of a flexible substrate.

[Drawing 4] In the piezo-electric buzzer shown in drawing 1 , it is the partial side elevation showing the anchoring condition of a protruding piece.

[Drawing 5] It is the development view of the flexible substrate of the piezo-electric buzzer shown in drawing 1 to the circuit pattern on the substrate by the side of electronic equipment.

[Drawing 6] It is the top view of the conventional case-less piezo-electricity buzzer.

[Drawing 7] It is a fragmentary sectional view in the condition of having built into electronic equipment the piezo-electric buzzer shown in drawing 6 .

[Drawing 8] It is the sectional view of the conventional case mold piezo-electricity buzzer.

[Description of Notations]

1 Flexible Substrate

2 Electrical Conductive Gum (Electric Conduction Elastic Body)

3 Diaphragm

4 Piezoelectric Device

5 Protective Cover

6 Protruding Piece

1a, 1b Current carrying part (terminal)

1c Current carrying part

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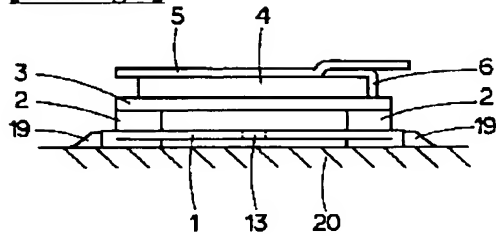
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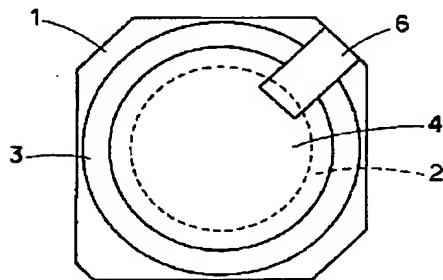
**DRAWINGS**

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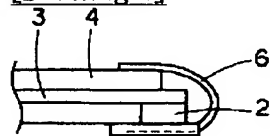
**[Drawing 1]**



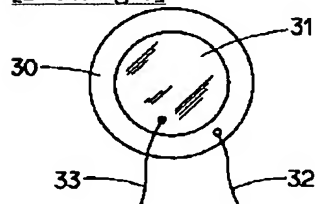
**[Drawing 2]**



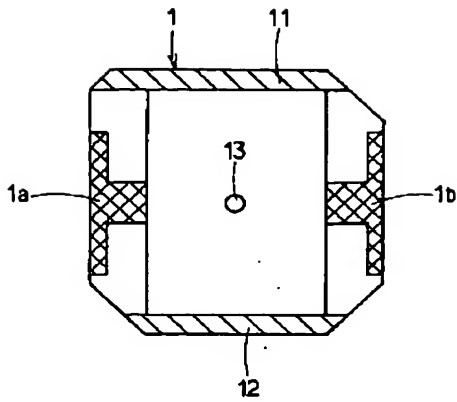
**[Drawing 4]**



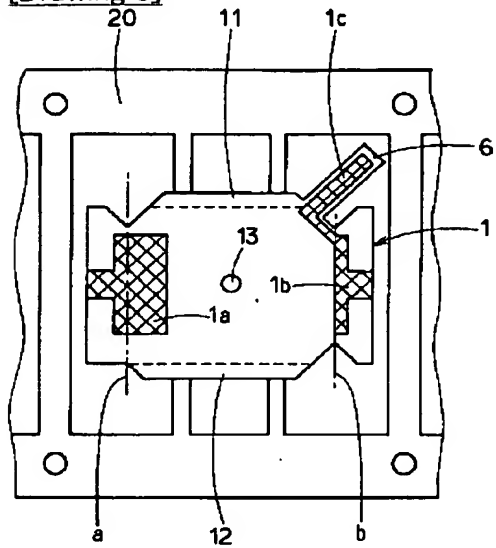
**[Drawing 6]**



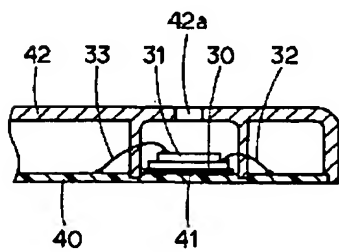
**[Drawing 3]**



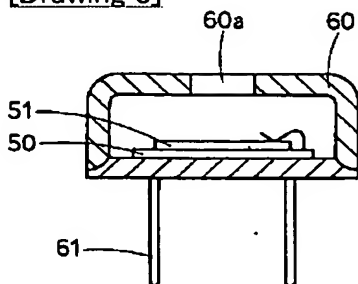
[Drawing 5]



[Drawing 7]



[Drawing 8]





(19)日本国特許庁(JP)

(12) 公開特許公報(A)

(11)特許出願公開番号

特開平5-273983

(43)公開日 平成5年(1993)10月22日

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G 1 0 K 9/12	1 0 1	7227-5H		
H 0 4 R 17/00		7406-5H		

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(22)出願日 平成4年(1992)3月30日

(71)出願人 000116024

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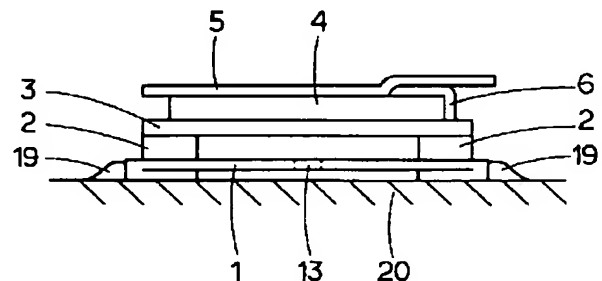
(74)代理人 弁理士 中村 茂信

(54)【発明の名称】 圧電プザー

(57)【要約】

【目的】 圧電プザーの電子機器への実装工程から人手による半田付け作業を不要にし、リフロー半田付け及び自動実装を可能にする。

【構成】 一対の導電部を設けたフレキシブル基板1の一部を基板裏面側に折り曲げ、基板裏面側に現れる導電部を端子とし、一方の導電部に接触させて環状の導電ゴム2を基板1上に取り付け、導電ゴム2上に振動板3と圧電素子4を順に固定し、他方の導電部に導通する導電部を有する突片6を圧電素子4に接続し、更に圧電素子4の表面を保護カバー5で被覆した。



## 【特許請求の範囲】

【請求項１】一対の端子を設けたフレキシブル基板上に、一方の端子に接触させた導電弾性体を設け、この導電弾性体上に振動板及び圧電素子を順に取付け、他方の端子と圧電素子を接続し、更に圧電素子の表面を取り外し可能な保護カバーで被覆したことを特徴とする圧電ブザー。

## 【発明の詳細な説明】

## 【０００１】

【産業上の利用分野】本発明は、例えば電卓や電子手帳 10 内に蔵される圧電ブザーに関する。

## 【０００２】

【従来の技術】電卓や電子手帳等の小型の電子機器には、警告音や確認音等を発する音源として必ずといってよいほど圧電ブザーが使用されている。この圧電ブザーには、ケースに入れられたものと、そうでないものがある。ケース無しの圧電ブザーは、図６に示すように振動板 30 上に圧電素子 31 を接着し、それぞれにリード線 32、33 を接続したものであり、これをそのまま図 7 に示すように電子機器に組み込んである。この場合には、電子機器のケース 42 内に設けてある基板 40 の所 20 定位置に振動板 30 を両面テープ 41 等で固定し、振動板 30 上に圧電素子 31 を取付けた後、リード線 32、33 を介して振動板 30 と圧電素子 31 を基板 40 上の配線パターン（図示せず）に半田付けする。なお、ケース 42 には、ブザー音をケース外部に導くための取出口 42a が形成されている。

【０００３】一方、ケース型の圧電ブザーは、図８に示すように、音の取出口 60a と一対のリードピン 61 を有するケース 60 内に、振動板 50 と圧電素子 51 を配 30 置したものである。この場合には、ケース 60 自体が共鳴体として機能する。

## 【０００４】

【発明が解決しようとする課題】ところで、図７のように圧電ブザーを裸のまま電子機器に実装するのは、圧電素子 31 が耐熱性に劣るためと、電卓や電子手帳等は小型でスペースに制約（特に厚み方向の制約）があり、機器のケース 42 を圧電ブザーのケースとするためである。このため、圧電素子 31 を機器側の基板 40 に半田 40 付けする作業は、どうしても人手に頼る場合が多い。

【０００５】従って、本発明の目的は、圧電ブザーの電子機器への実装工程から人手による半田付け作業を不要にし、リフロー半田付け及び自動実装を可能にする圧電ブザーを提供することにある。

## 【０００６】

【課題を解決するための手段】前記目的を達成するために、本発明の圧電ブザーは、一対の端子を設けたフレキシブル基板上に、一方の端子に接触させた導電弾性体を設け、この導電弾性体上に振動板及び圧電素子を順に取付け、他方の端子と圧電素子を接続し、更に圧電素子の

表面を取り外し可能な保護カバーで被覆したことを特徴とする。この構成では、導電弾性体を介して振動板と圧電素子をフレキシブル基板に取付けてあるため、リフロー半田付けをすることができ、電子機器側の基板に自動で面実装可能となる。しかも、圧電素子表面が保護カバーで覆われているため、リフロー半田付けを行っても圧電素子にフラックスが付着したり、半田くずが飛散したりするのを防止することができる。

【０００７】なお、本発明の圧電ブザーを構成するフレキシブル基板、導電弾性体及び保護カバーは、リフロー半田付け時の熱を考慮していずれも耐熱性であることが好ましい。特に、保護カバーに例えばアルミニウムを蒸着することにより、熱反射性が高まり、熱に弱い圧電素子を効果的に保護することができる。

## 【０００８】

【実施例】以下、本発明の圧電ブザーを実施例に基づいて説明する。その一実施例に係る圧電ブザーを、電卓や電子手帳等の電子機器内の基板（例えばポリイミドフレキシブル基板）に取付けた状態の側面図を図１に示す。この圧電ブザーは、一対の端子を有する耐熱性のフレキシブル基板 1 と、この基板 1 上に一方の端子に接触させて取付けた環状の導電弾性体（例えばシリコンとカーボンからなる耐熱性の導電ゴム） 2 と、導電ゴム 2 上に順に設けた振動板 3 及び圧電素子 4 と、圧電素子 4 の表面に取り外し可能に貼付した耐熱性の保護カバー（例えばアルミニウムを蒸着したフィルム又はシート） 5 とで構成されている。フレキシブル基板 1 は電子機器側の基板 20 にリフロー半田付けにより実装され、フレキシブル基板 1 の導電部（後述）と基板 20 上の配線パターン（図示せず）とが半田フィレット 19 で接続される。又、基板 1 の他方の端子と圧電素子 4 は、突片 6 によって接続してある。

【０００９】上記圧電ブザーにおいて保護カバー 5 を剥がした状態の平面図を示す図２から分かるように、フレキシブル基板 1 はほぼ四角形状を呈し、この四角形状基板 1 の外周寄りに環状の導電ゴム 2 が取付けられ、導電ゴム 2 に接触させて円形の振動板 3 が固定され、更に振動板 3 上に円形の圧電素子 4 が固定されている。この実施例では、機器側の基板 20 に半田付けされる前のフレキシブル基板 1 は、図５に示すような状態である。即ち、この基板 1 の表面には、図中に網線で示すようなパターンの導電部 1a、1b が形成されており、更に導電部 1b は基板 1 に付設された突片 6 に形成された導電部 1c に連続する。基板 1 の裏面には、一対の対向辺に沿って適当な補強材 11、12 が接合されている。又、基板 1 の中央には空気流路となる穴 13 が穿設されている。

【００１０】このような基板 1 を機器側の基板 20 に取付ける場合、図中に一点鎖線 a、b で示す箇所から線 50 a、b の外側部分を基板 1 の裏面側に折り曲げる。折り

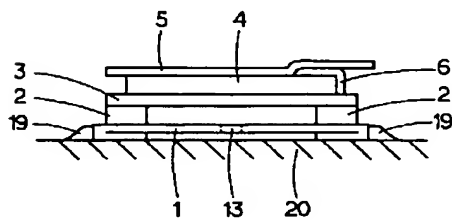
曲げた状態の基板1の裏面図を図3に示す。図3から分かるように、導電部1a、1bの、それぞれの一点鎖線a、bの外側部分が基板1の裏面に現れることになり、この裏面側に在る導電部1a、1bが端子となり、機器側の基板20に設けられた配線パターンに半田付けされる。

【0011】図5には示していないが、環状の導電ゴム2は導電部1aに接触し、導電部1bには接触しない。又、図4に示すように、突片6は圧電素子4上に連結され、これにより突片6の導電部1cが圧電素子4に接続される。従って、機器側の配線パターンから導電部1a、導電ゴム2を通じて振動板3に至る回路と、機器側の配線パターンから導電部1b、導電部1cを通じて圧電素子4に至る回路とが形成され、両回路を介して振動板3と圧電素子4に電圧が印加される。

【0012】このように構成した圧電ブザーでは、機器側の基板20への実装に際しては、まずフレキシブル基板1の一部を前記のように一点鎖線a、bから裏面側に折り曲げる。その後、リフロー半田付けを行うのであるが、フレキシブル基板1、導電ゴム2、保護カバー5は耐熱性であるため、リフロー半田付け時に熱の影響は受けない。又、圧電素子4が保護カバー5で覆われているため、圧電素子4にフラックスが付着したり、半田くずが飛散することはない。半田付けによって基板1裏面側の導電部1a、1bが基板20上の配線パターンに接続された後、保護カバー5を剥がすことにより、圧電ブザーの機器への実装が完了する(図1参照)。

【0013】そして、前記回路を通じて振動板3と圧電素子4に電圧が印加されると、周知のとおり圧電素子4によって振動板3が振動し、ブザー音が発せられる。勿論、振動板3の外周のみが導電ゴム2で支持され、フレキシブル基板1に穴13が存在するため、振動板3の振動に支障を来すようなことはない。

【図1】



## 【0014】

【発明の効果】本発明の圧電ブザーは、以上説明したように構成されるので、下記の効果を有する。

(1) 人手による半田付け作業が不要になり、リフロー半田付け及び自動実装が可能になり、しかもフープ状で組み立てることができるため、量産性に優れている。

(2) 極めて薄くて軽い面実装型とすることができる。

## 【図面の簡単な説明】

【図1】本発明の一実施例に係る圧電ブザーを電子機器に実装した状態の側面図である。

【図2】図1に示す圧電ブザーにおいて、保護カバーを剥がした状態の平面図である。

【図3】図1に示す圧電ブザーにおいて、フレキシブル基板の裏面図である。

【図4】図1に示す圧電ブザーにおいて、突片の取付け状態を示す部分側面図である。

【図5】電子機器側の基板上の配線パターンに対する、図1に示す圧電ブザーのフレキシブル基板の展開図である。

【図6】従来のケース無し圧電ブザーの平面図である。

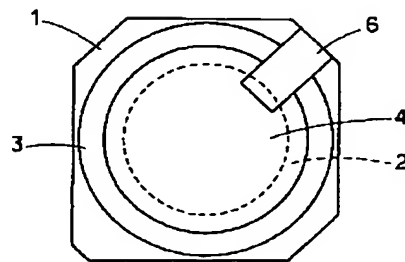
【図7】図6に示す圧電ブザーを電子機器に組み込んだ状態の部分断面図である。

【図8】従来のケース型圧電ブザーの断面図である。

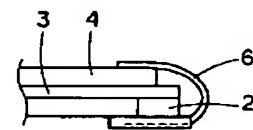
## 【符号の説明】

- |       |             |
|-------|-------------|
| 1     | フレキシブル基板    |
| 2     | 導電ゴム(導電弾性体) |
| 3     | 振動板         |
| 4     | 圧電素子        |
| 5     | 保護カバー       |
| 6     | 突片          |
| 1a、1b | 導電部(端子)     |
| 1c    | 導電部         |

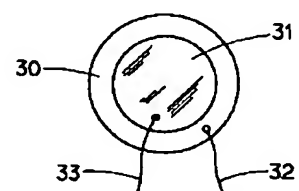
【図2】



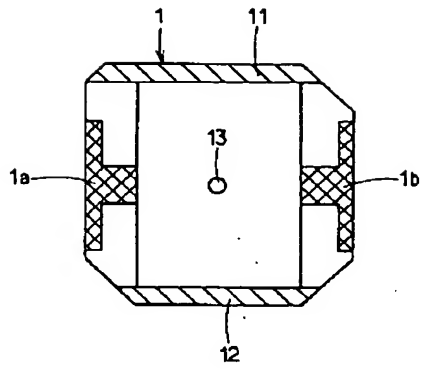
【図4】



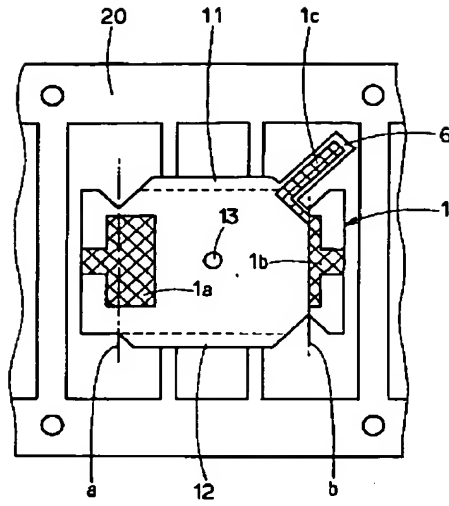
【図6】



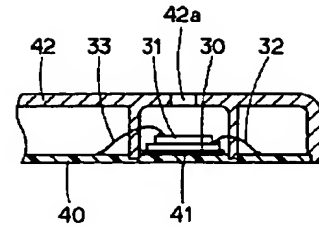
【図 3】



【図 5】



【図 7】



【図 8】

